

## Identifying individual smooth newts (*Lissotriton vulgaris*) from ventral spot patterns.

Mark Edwards (@Mark\_Edwards1)



### Question?

Can we show that using ventral spots is a valid method of identifying smooth newts?

Edwards, M.T., Souldbury, C.D. and Deerning, D.C.  
(submitted March 2014) Identifying smooth newts (*Lissotriton vulgaris*) using ventral patterns.

**Question**  
Can we show that using ventral spots is a valid method of identifying smooth newts?

**Method**  
Photograph newts and analyse ventral spot patterns using a custom-built software package.

**Results**  
The method was able to identify individual newts with 100% accuracy.

**Visual evidence**  
Images showing the ventral spot patterns of individual newts, demonstrating the unique patterns used for identification.

**Smooth newt method**  
Large dataset is 200 individual newts. Photograph newts and analyse ventral spot patterns using a custom-built software package.



Ten males & ten females  
3 pictures of each  
Use multi tool in ImageJ  
Landmark: right snout & bottom  
& spots in the orange stripe



### Conclusions

The method of visual identification for smooth newts has been validated using morphometric software and statistical analysis.

**Future work**  
Many other methods are proposed to generate algorithms to identify individuals or at least narrow the field.

**Thanks to my supervisors**  
Dr Souldbury & Dr Deerning  
Who gave me the idea for this project.



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Mark Edwards BSc (Hons) AMSB, UOL PG Conference, April 2014. #pgconf14

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Can we show that using ventral spots is a valid method of identifying smooth newts?

**Method**  
Photograph newts and analyse ventral spot patterns using software.

**Visual evidence we have**



**Smooth newt method**  
Large dataset is 200 individual photographs, newts are analysed individually manually using a set of criteria.



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**Future work**  
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Google Images



Sexually dimorphic spot patterns





Sexually dimorphic spot patterns



# Population studies

- Population size / dynamics
- Changes in population
- Temporal changes in individuals

## Method

Capture individuals

Mark or identify then release

**Capture more individuals**

**Check for previously caught animals**

**Mark or identify release**

Percentage of recaptures can be used to calculate overall population size

Known as capture-mark-release or C-M-R

Amphibians historically marked using toe clipping / tipping or pit tagging

### Some key assumptions

Marks should not not impinge upon an individual's lifetime fitness

- cause no pain
- little stress
- inexpensive
- Last for the duration of a study

This invalidates toe clipping and other invasive methods



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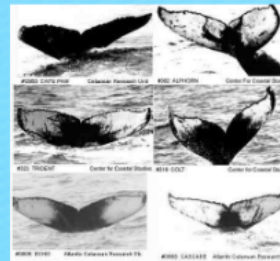
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# Natural markings are better

- Stripes in zebra
- Blotches in giraffe
- Ear shape / damage in elephant
- Fins / tails in Cetaceans



Google images



## Great crested newts

Unique markings  
Accepted as valid method to  
identify individuals



Method previously used for  
smooth newts but not validated





#0303 CAT'S PAW

Cetacean Research Unit



#302 ALPHORN

Center For Coastal Studies



#323 TRIDENT

Center for Coastal Studies



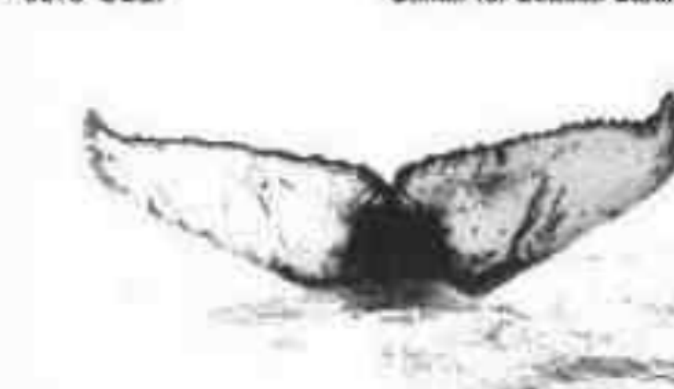
#319 COLT

Center for Coastal Studies



#0805 ECHO

Atlantic Cetacean Research Ctr



#0608 CASCADE

Atlantic Cetacean Research Ctr

Better

nant

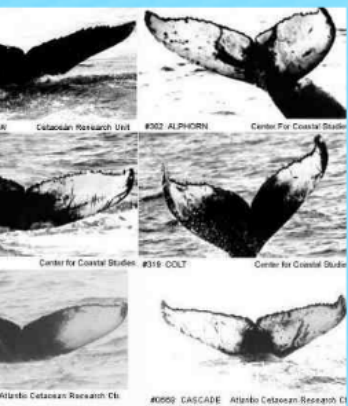
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# Smooth newt method

Large data set (c. 500 individuals)  
Photographed, measured & weighed  
Identified manually using spot patterns



## Method

- Imagej landmarks converted to a text file of x,y co-ords
- Exported to MorphoJ
- Procrustes fit
- Principle component analysis
- PCA values exported to PAST
- Tested with NP MANOVA
- PCA values exported to R
- Tested for repeatability using rptR



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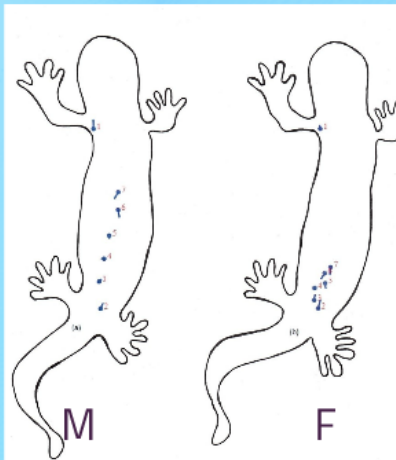
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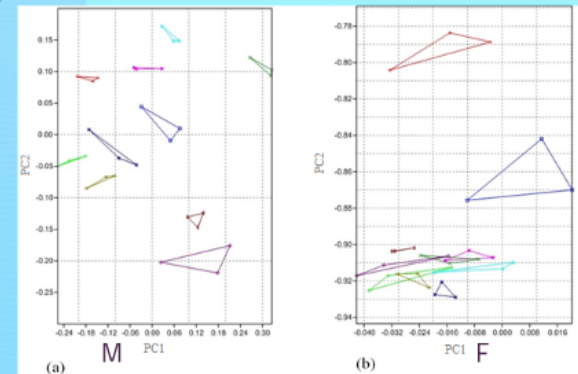


# Results

PCA output:  
Males v Females  
Mostly anterior-posterior variation

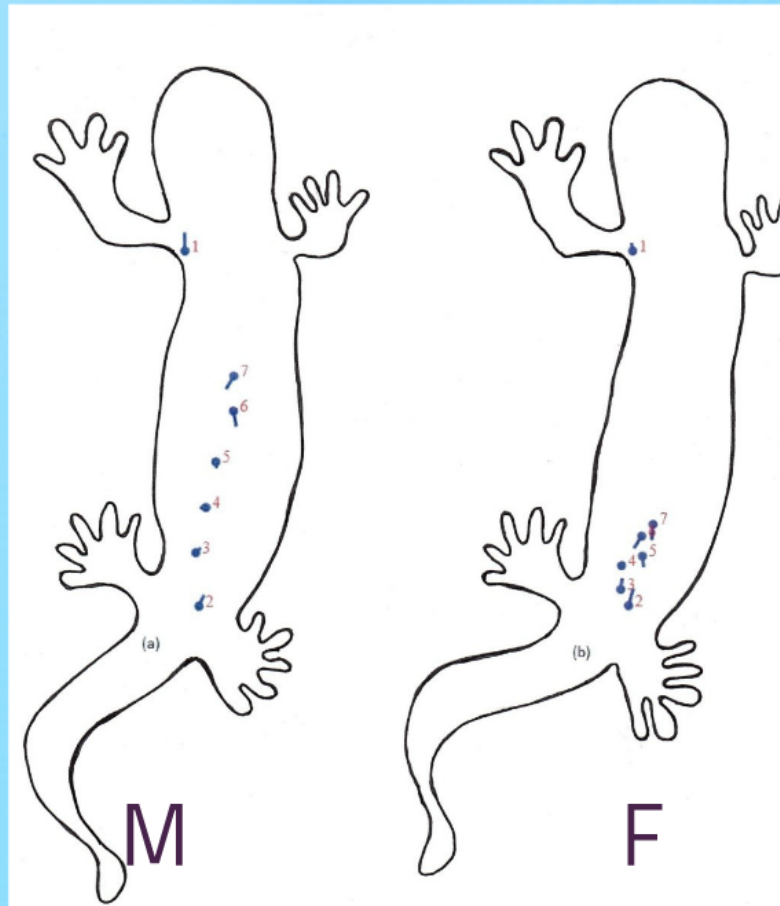


PC 1 vs PC 2  
Linked by convex hulls



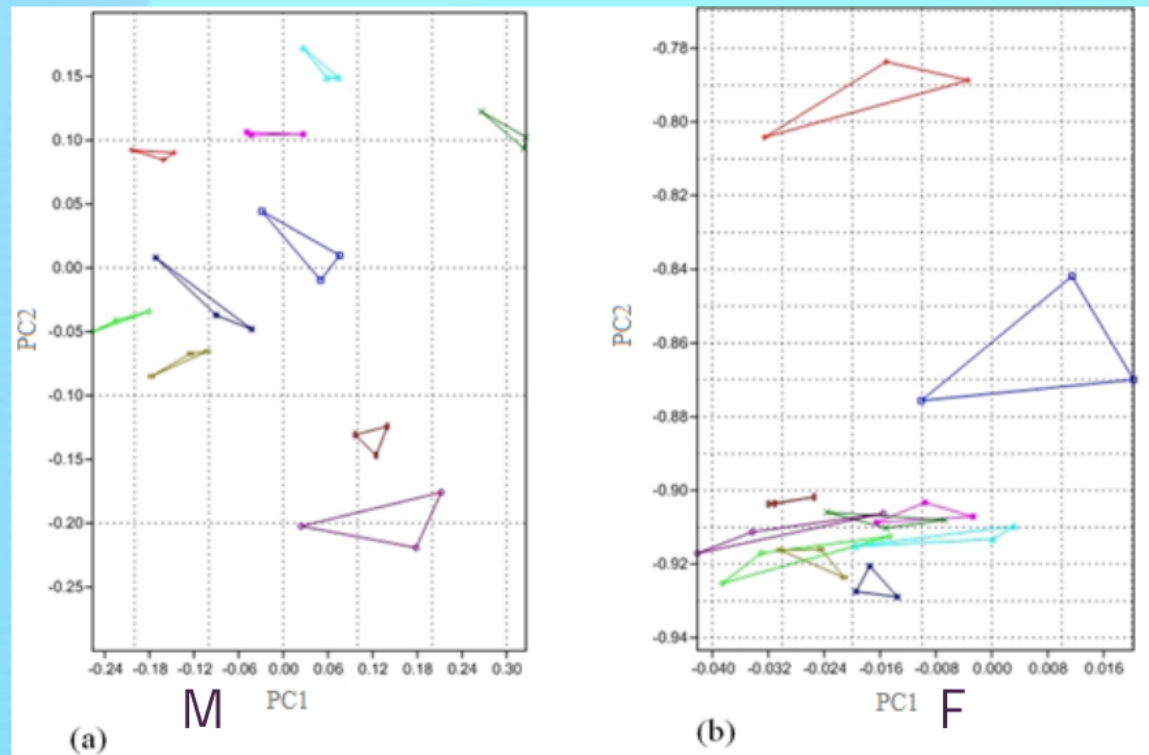
Individuals colour coded  
Manova showed:  
Males  $P < 0.001$   
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Thanks to my co-authors



Carl Soulsbury & Charles Deeming

Thanks also to Marcello Ruta for statistical help and advice



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1. Image: [http://rsb.info.nih.gov/ij/\\_2\\_](http://rsb.info.nih.gov/ij/_2_), <http://www.flywings.org.uk/Morphol>
3. R Core Team. 2013. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.
4. PAST: <http://folk.uio.no/ohammer/past-Ver2.17>



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Any  
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